SUSTAINABLE FARMING

Regenerative agriculture – Seeking sustainable farming systems through integrated management approaches

GWCT THE ALLERTON PROJECT

NIAB

ECAF
European Conservation Agriculture Federation

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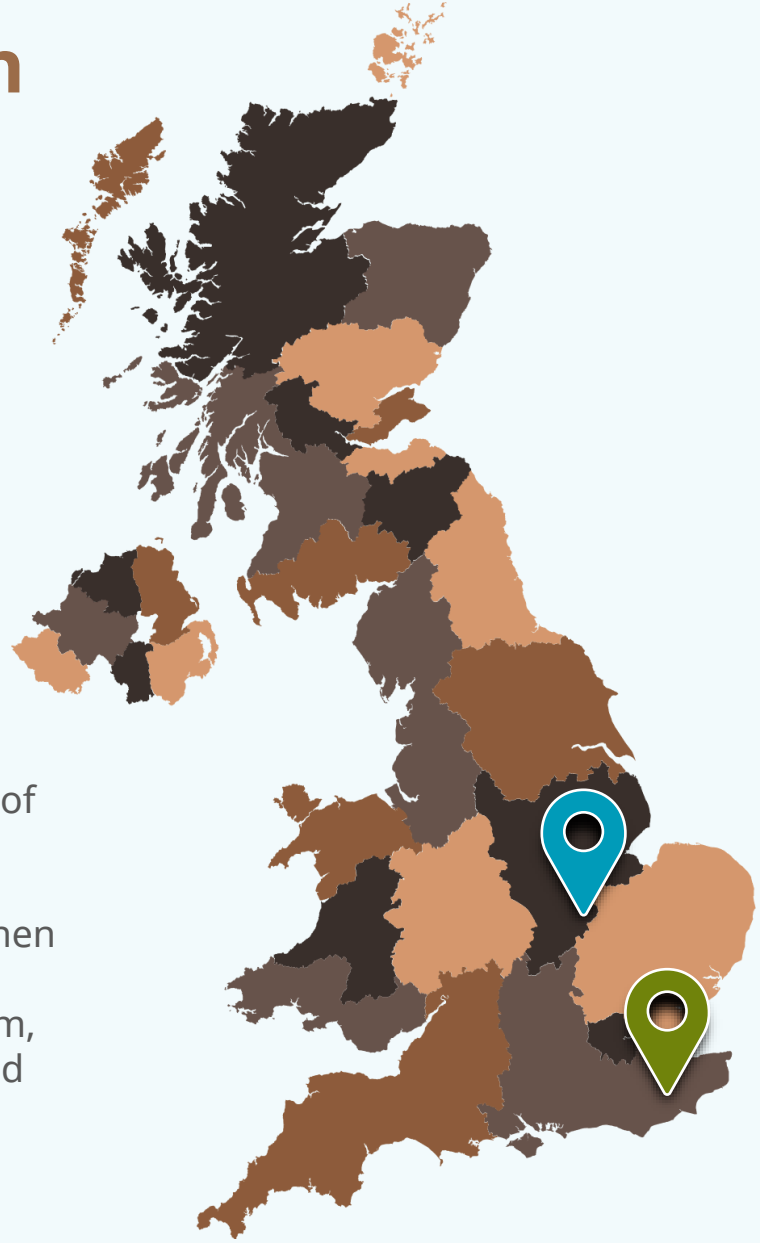
Conservation agriculture project: UK sites 2018 - 2022



Purpose of study

Develop an understanding of a cereal cropping system based on Conservation Agriculture principles so when moving towards a more sustainable cropping system, adoption can be quicker and more reliable for growers.

SUSTAINABLE FARMING

Loddington

Joe Stanley

Head of Training & Partnerships – The Allerton Project

Lenham

Andy Barr

Farmer, Kent

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Conservation agriculture project: Three systems

SUSTAINABLE FARMING

Conventional:
150-200 mm depth inversion cultivation

Sustainable System 1:
100-150 mm depth non-inversion cultivation + cover crops

Sustainable System 2:
0-100 mm depth light cultivation / DD + cover crops

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Field rotation

SUSTAINABLE FARMING

Loddington Fields	Crop				
	2018	2019	2020	2021	2022
Cawthorn	Winter Barley	Winter OSR	Spring Wheat	Spring Beans	Winter Wheat
Upper Pond North	Winter OSR	Winter Wheat	Spring Beans	Spring Wheat	Spring Barley
Cabins South	Spring Beans	Winter Wheat	Spring Barley	Winter OSR	Winter Wheat
Holloways	Winter Wheat	Spring Beans	Spring Wheat	Winter Barley	Winter OSR
Collie Top	Winter Wheat	Winter Barley	Spring Oats	Spring Wheat	Spring Beans

Lenham Fields	Crop			
	2019	2020	2021	2022
Cherry Gardens	Winter OSR	Winter Wheat	Spring Barley	Spring Peas
Oak Tree	Winter Wheat	Spring Barley	Spring Peas	Winter Wheat
Finger Post	Spring Beans	Winter Wheat	Winter OSR	Winter Wheat
Top Hill	Spring Barley	Spring Beans	Winter Wheat	Winter OSR

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Value assessment model

SUSTAINABLE FARMING

- Adoption readiness
- Affordability
- Farmer profile

- Resource management
- Environmental health (water protection, climate change, soil health)
- Biodiversity
- Product availability
- CO_2 emmissions

- Monitoring pests, weeds and disease pressure
- Monitoring soil fertility (mineral N soil analysis)
- Assess scenarios impact on CP and fertilizers

- Record financial yield (yield x sales price) of cash crops
- Record costs for labour, fuel, machinery, CP, seed treatment, seeds, fertilizers, irrigation (where applicable), GCCS

- Record all operations (sowing, tillage, cultivation, spraying, fertilizer application, irrigation and harvesting)
- Capture time taken for operations
- Capture 'window' working days in which operations can be done

- Machinery
- Decision making support
- Rotation suitability
- Farmer profile

- Measure yield (whole plots and in-plot spatial variations)
- Measure quality of crops (moisture and protein content, bulk density)

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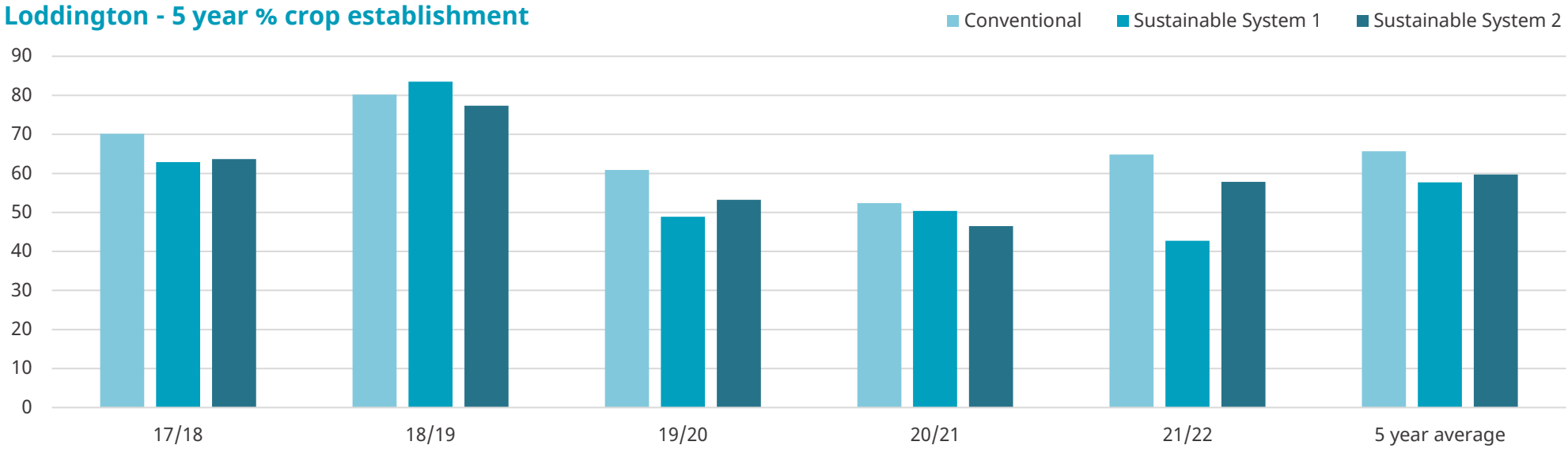
Crop establishment – Loddington



% Establishment	5-year average	Winter crops	Spring crops
Conventional	66	66	67
Sustainable System 1	58	65	49
Sustainable System 2	60	68	49

% Crop establishment	Winter Wheat	Winter Barley	Winter OSR	Spring Beans	Spring Wheat	Spring Barley	Spring Oats
Conventional	70	67	59	75	55	54	80
Sustainable System 1	70	72	53	62	39	40	40
Sustainable System 2	72	71	60	56	33	51	90

9%

Crop establishment – Lenham

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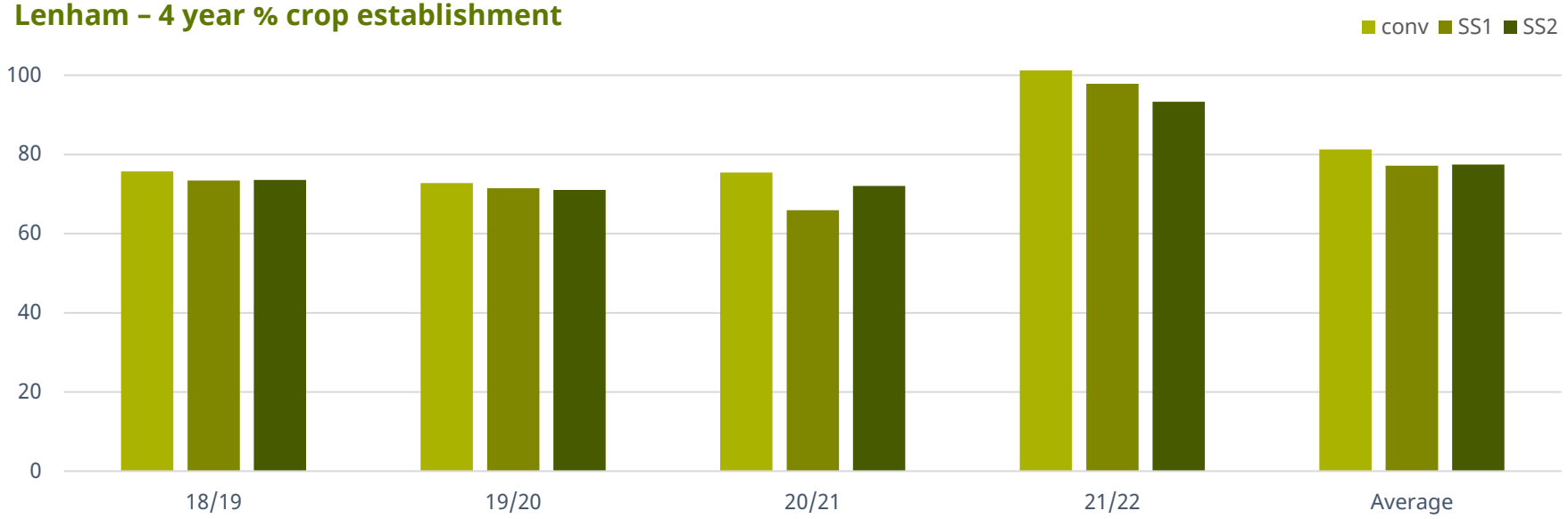
Lenham – 4 year % crop establishment



% Establishment	4-year average	Winter crops	Spring crops
Conventional	82	83	85
Sustainable System 1	77	74	82
Sustainable System 2	78	80	75

% Crop establishment	Winter Wheat	Winter OSR	Spring Beans	Spring Peas	Spring Barley
Conventional	75	88	96	91	70
Sustainable System 1	73	70	90	95	73
Sustainable System 2	74	84	83	95	62

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Soil organic matter

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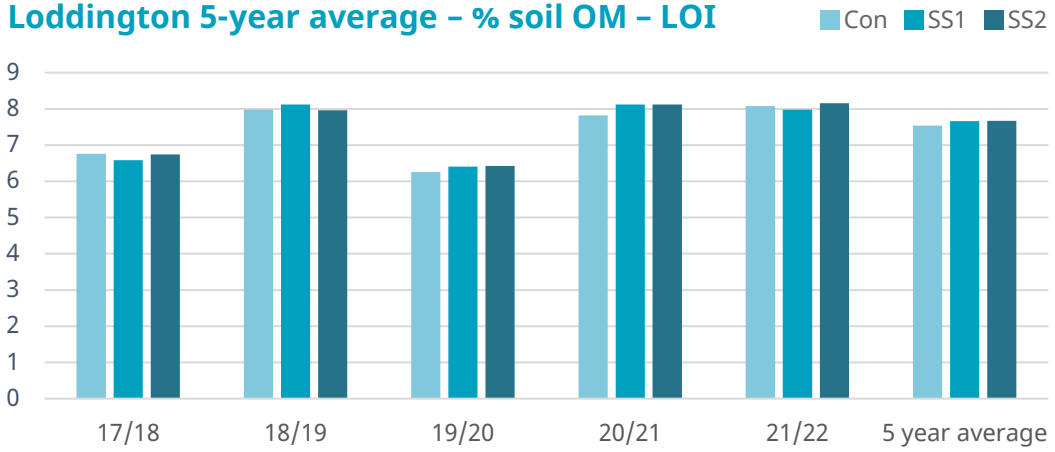
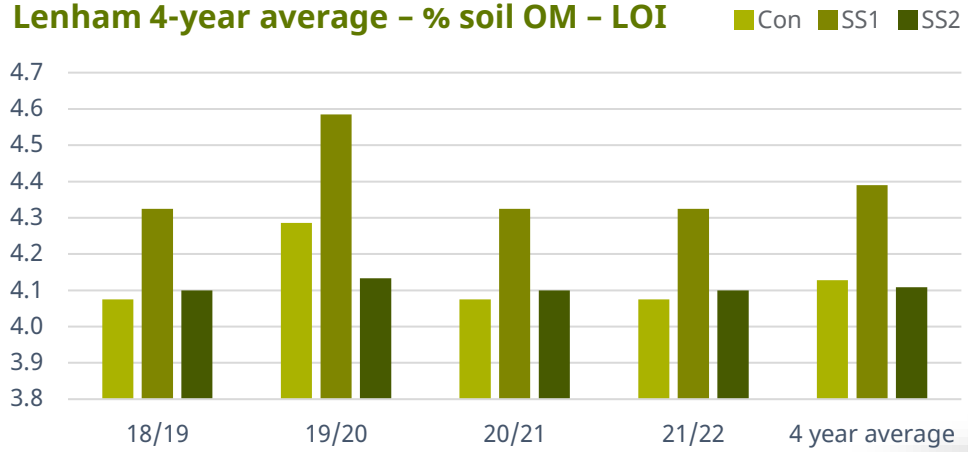
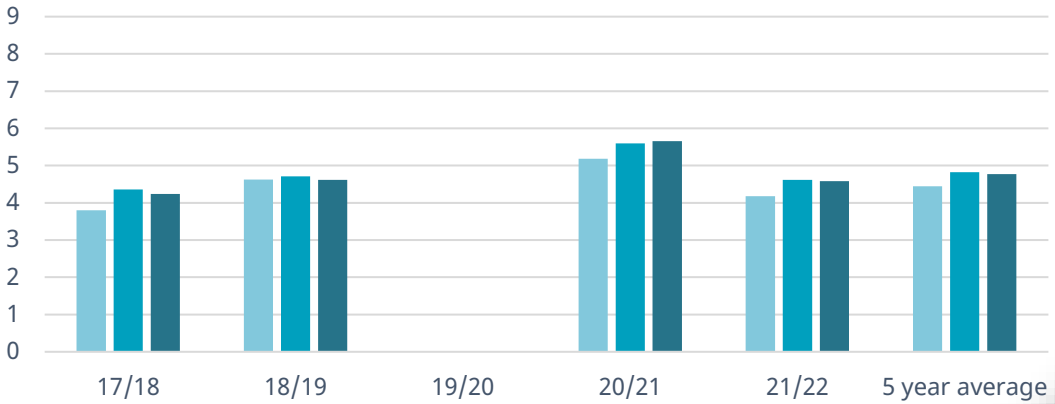
Loddington 5-year average – % soil OM – LOI



Lenham 4-year average – % soil OM – LOI



Loddington 5-year average – % soil OM – Dumas



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Earthworms

Epigeic Endogeic Anecic Juveniles

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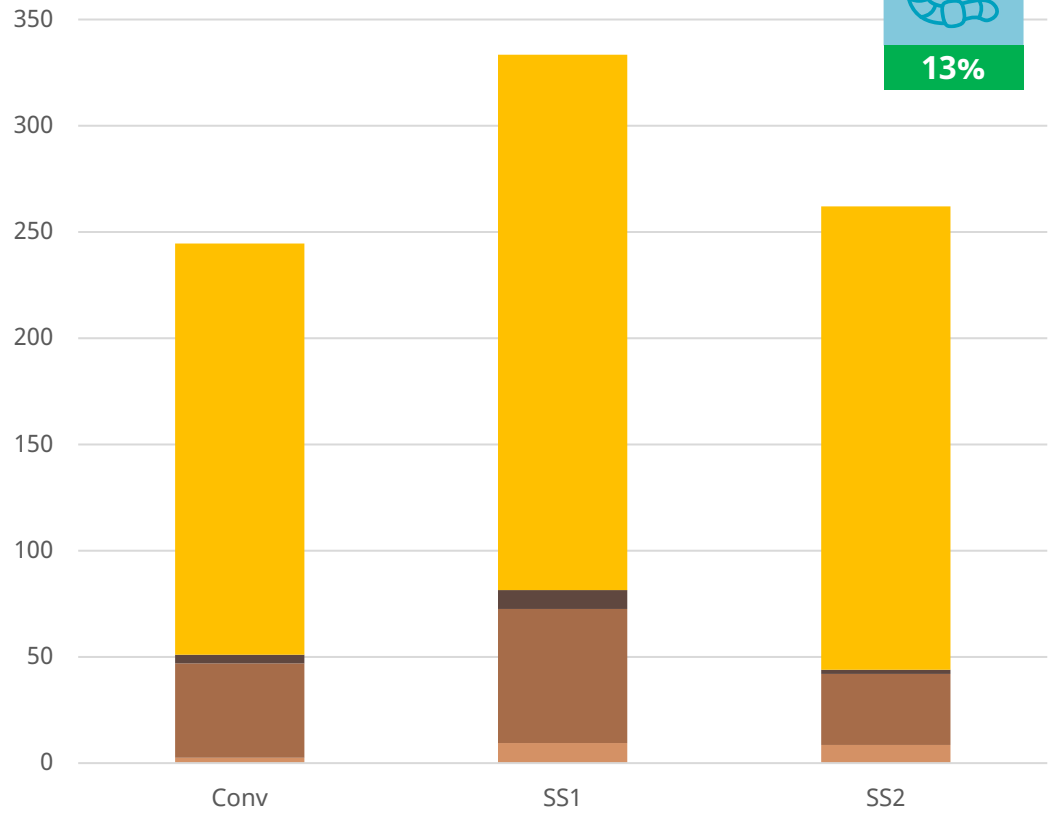
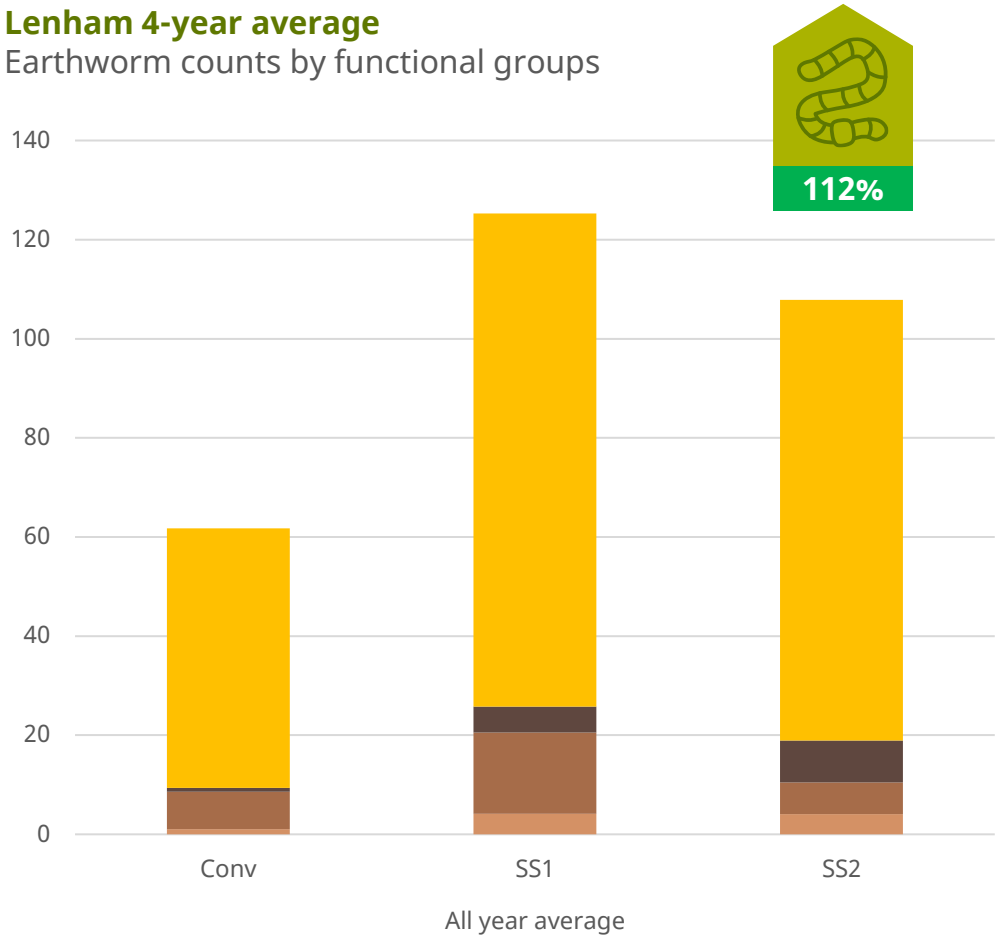
Loddington 5-year average

Earthworm counts by functional groups



Lenham 4-year average

Earthworm counts by functional groups



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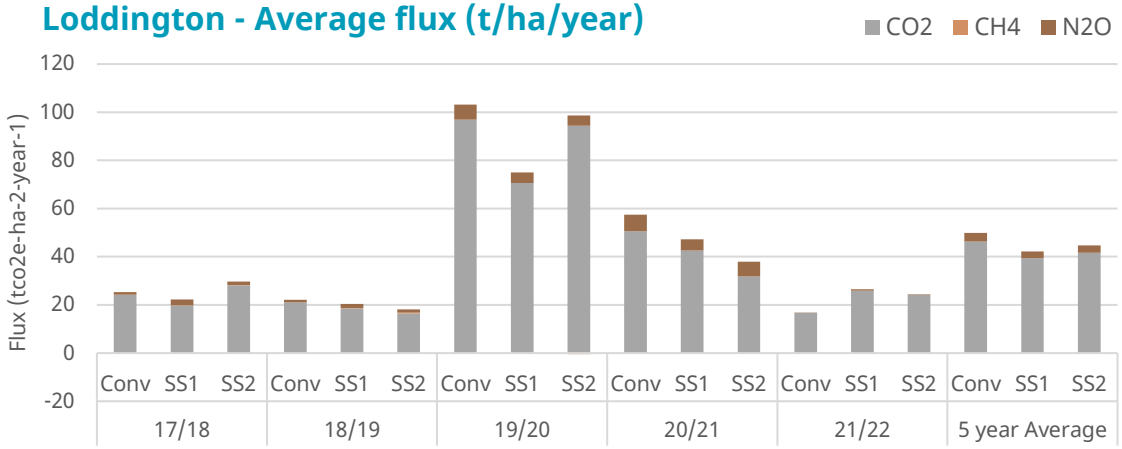
Soil Greenhouse gas emissions

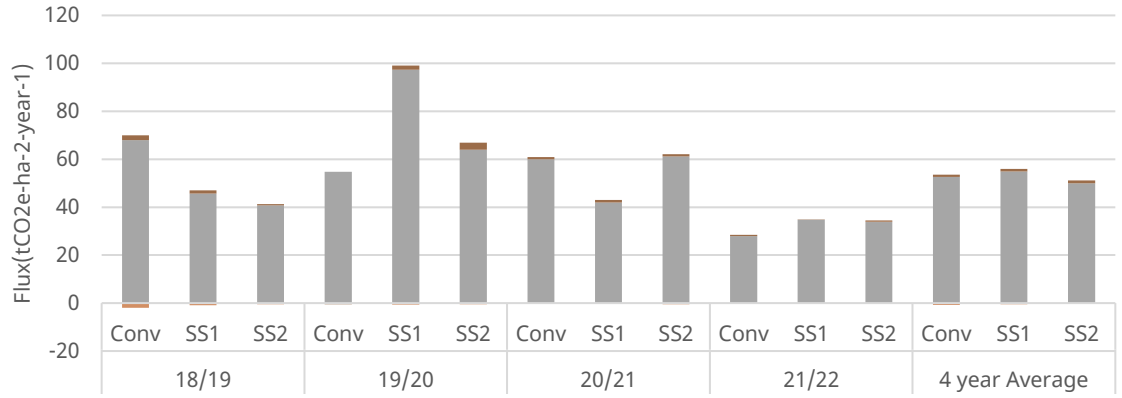
8%

Loddington - Average flux (t/ha/year)



5%

Lenham - Average flux (t/ha/year)



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How many km's could an average UK car travel to match the emission reductions per hectare seen between the conventional and SS2 for Loddington and Lenham?

36,000 km's / 22,000 miles

2022: average car emits 140g CO_2e/km
Loddington: 50t/ha to 45t/ha
Lenham: 53t/ha to 50t/ha

14,000 km's / 8,700 miles

Assuming a CO_2 equivalent of 21x for methane and 296x for Nitrous oxide.

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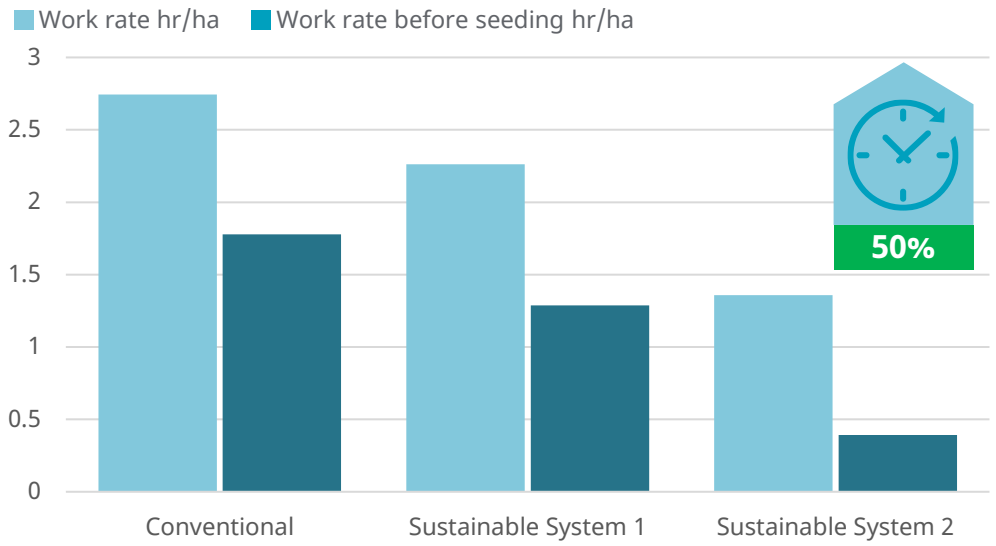
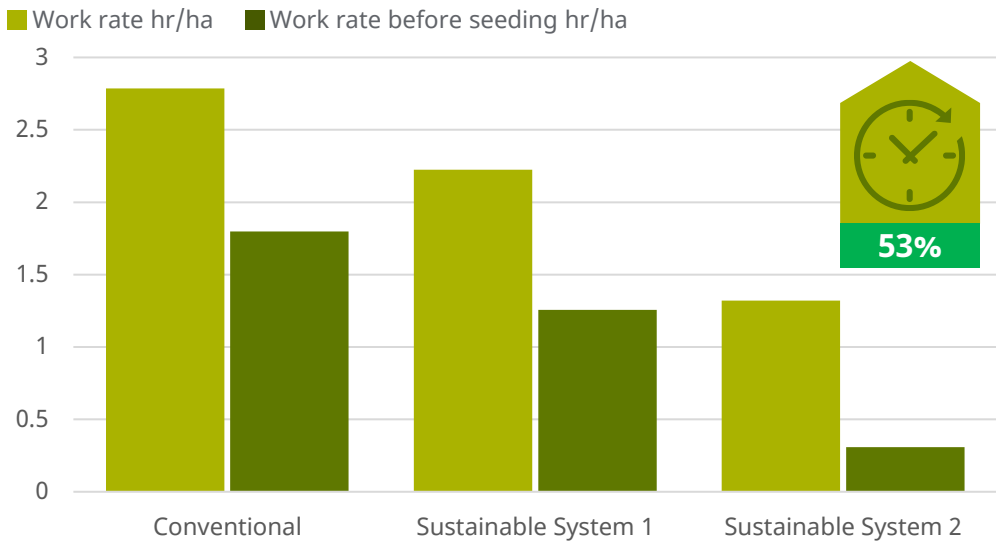
Work rate – hr/ha

Loddington – 5-year average work rate hr/ha



Lenham – 4-year average work rate hr/ha

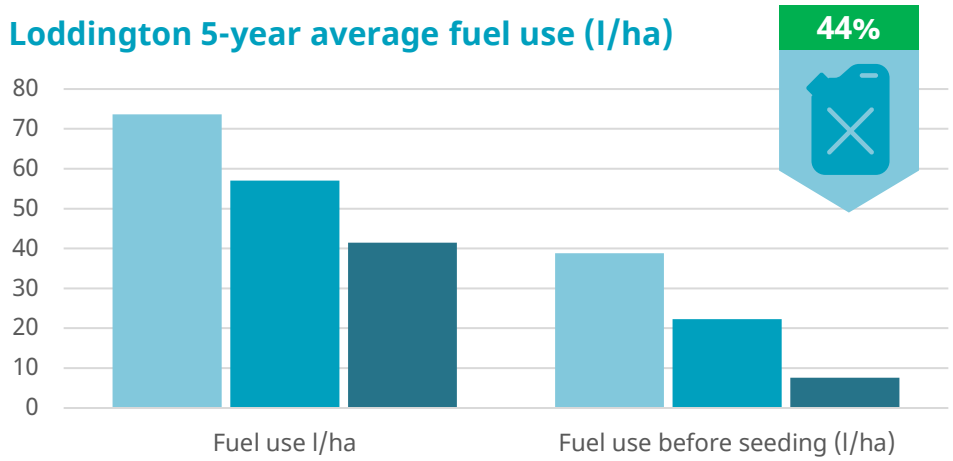


	Hr/ha	Ha/hr	Ha/8hr day	No days /100ha	Labour £/ha (£15/h)	Labour cost 100ha
Conventional	2.7	0.36	3.2	31	£40.50	£4,050
Sustainable System 1	2.3	0.43	3.4	29	£34.50	£3,450
Sustainable System 2	1.3	0.8	6.4	15.5	£19.5	£1,950

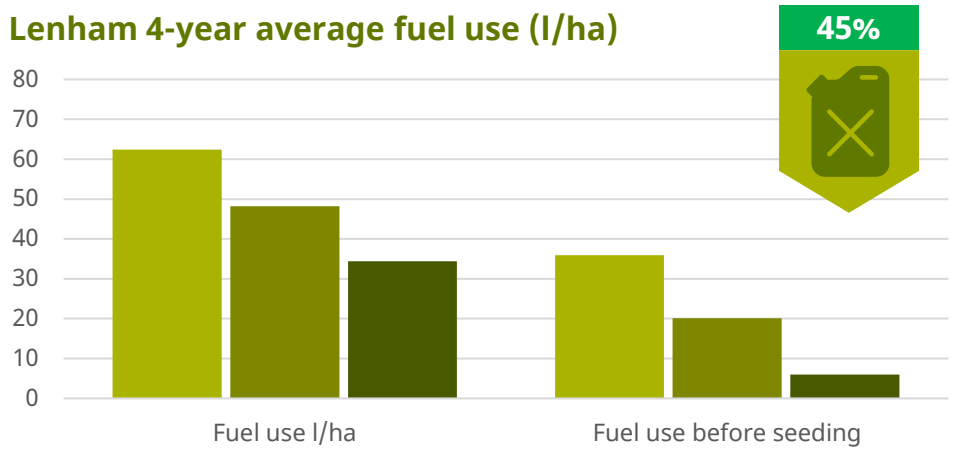
Fuel use

Con SS1 SS2 Con SS1 SS2

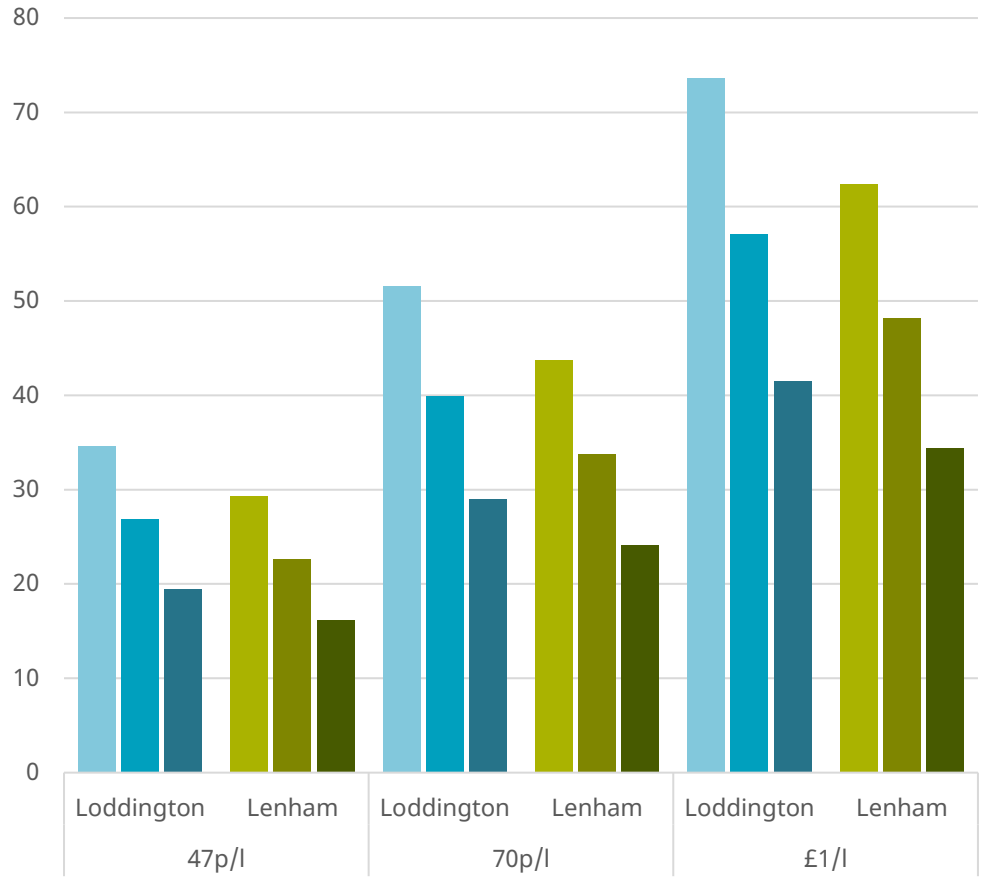
Loddington 5-year average fuel use (l/ha)



Lenham 4-year average fuel use (l/ha)



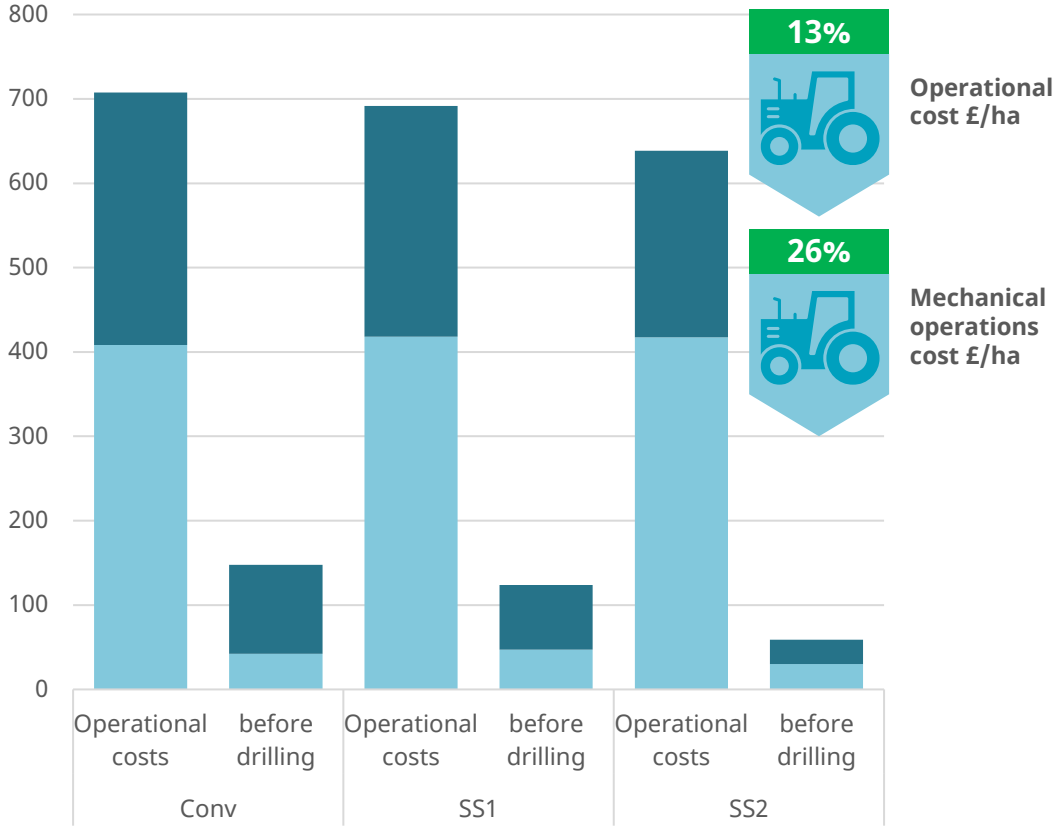
Fuel costs (£)



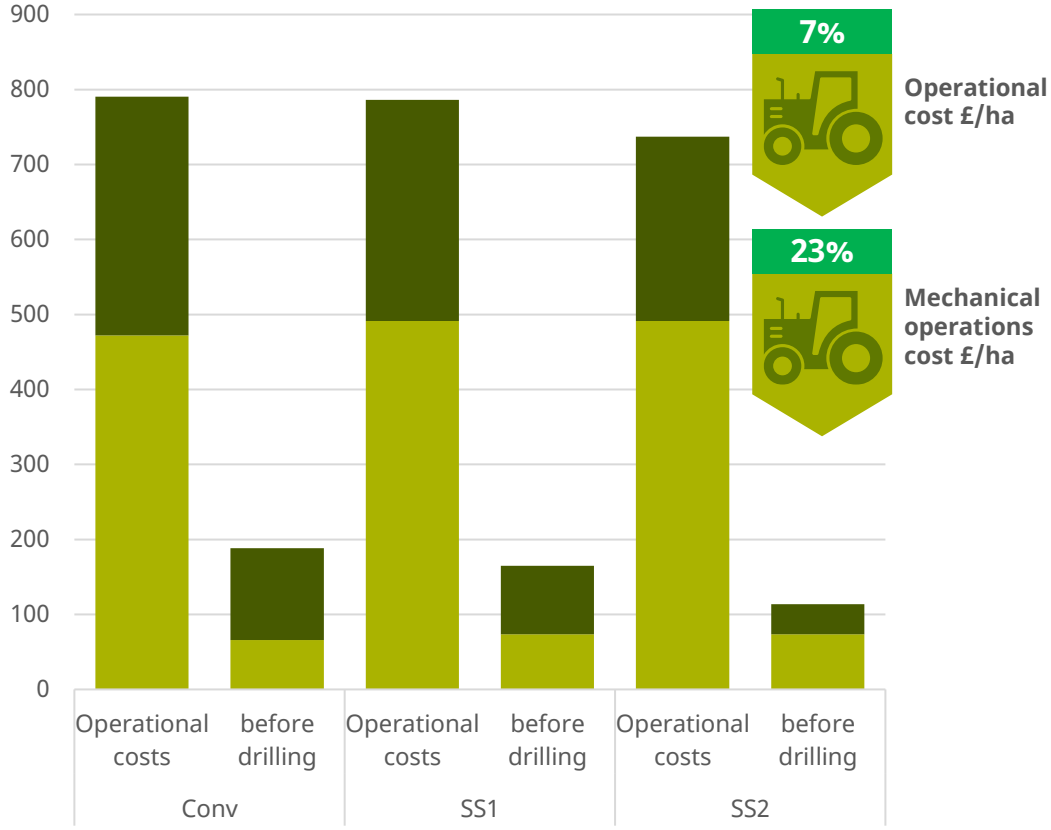
Operational costs

Input costs Mechanical costs

Loddington 5-year average operational costs (£/ha)

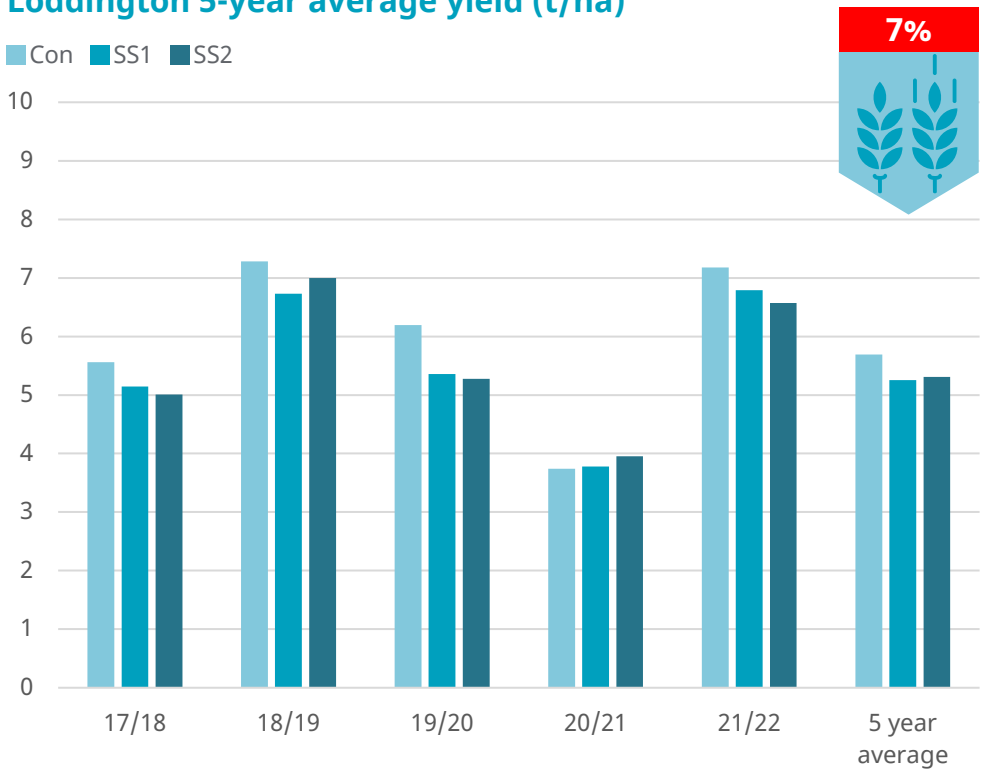


Lenham 4-year average operational costs (£/ha)

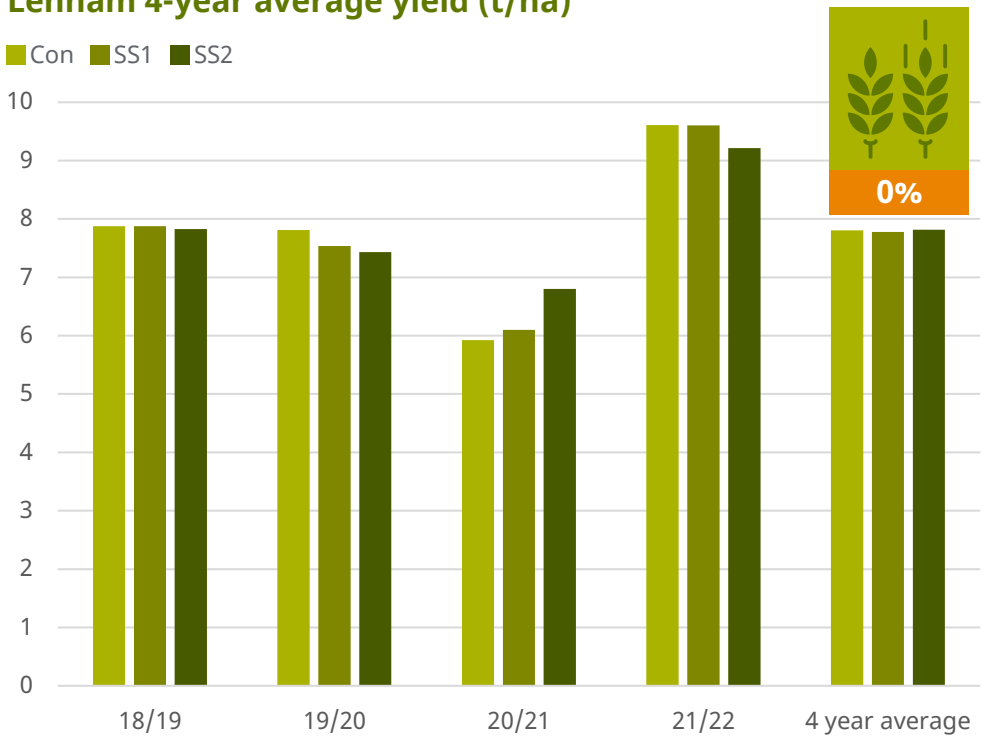


Crop productivity

Loddington 5-year average yield (t/ha)



Lenham 4-year average yield (t/ha)



Profitability: Loddington

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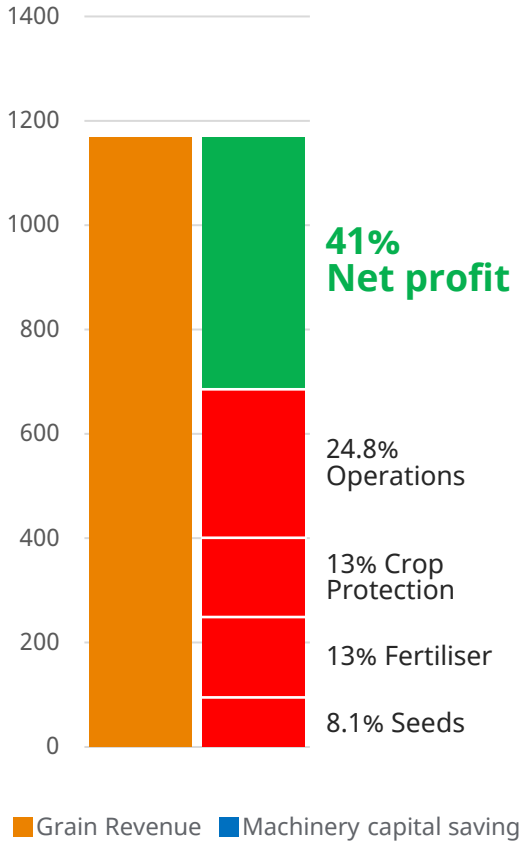
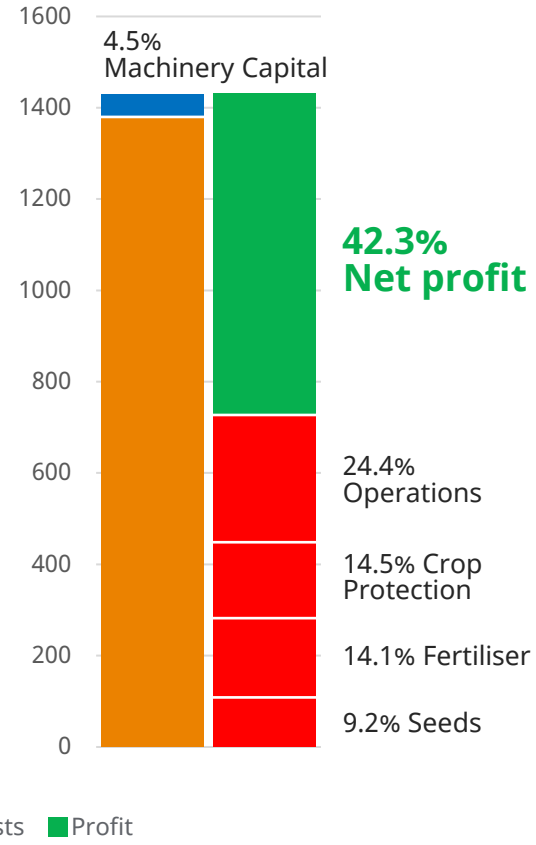
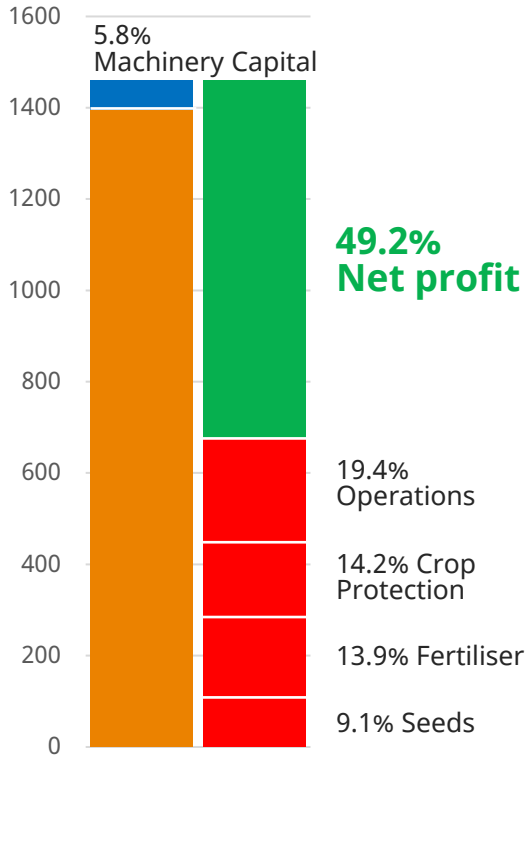
Conventional System
5-year average cost breakdown



Sustainable System 1
5-year average cost breakdown
with machinery cost savings



Sustainable System 2
5-year average cost breakdown
with machinery cost savings



Net profit:
Capital cost savings SS1 = £50/ha, SS2 = £65/ha compared to Conventional when spreading capital costs over 5 years

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Profitability: Lenham

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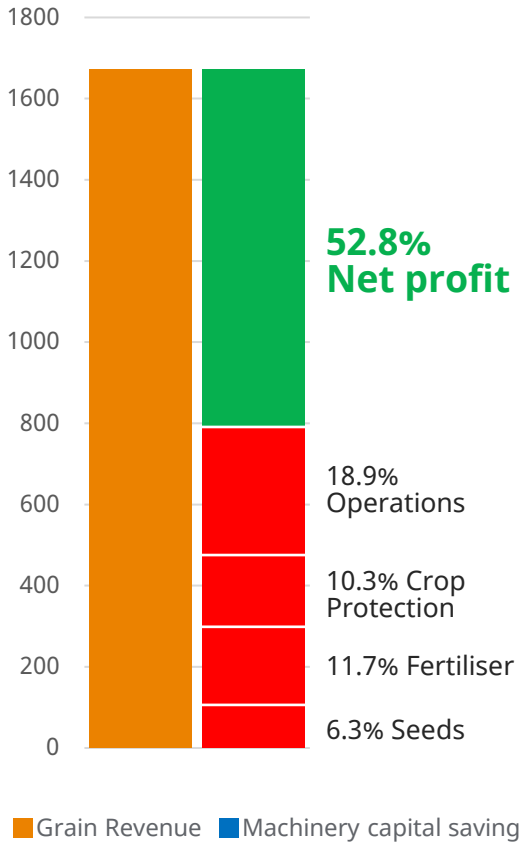
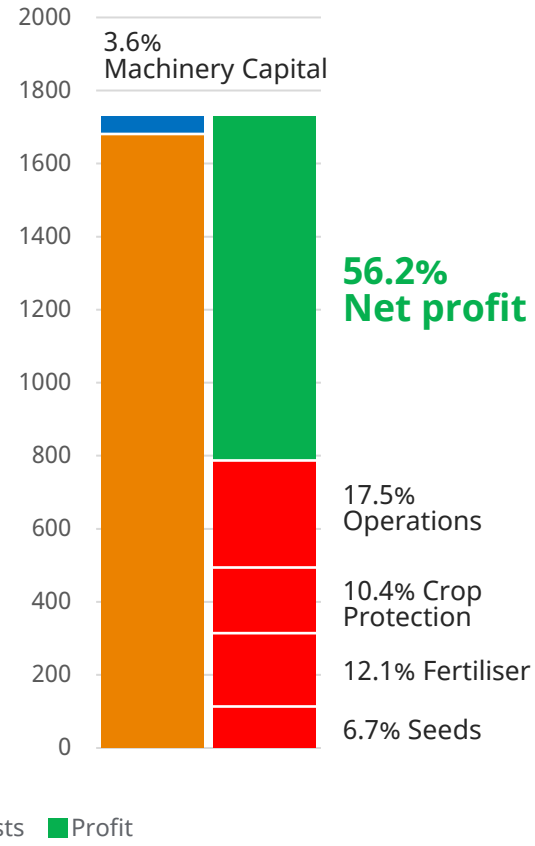
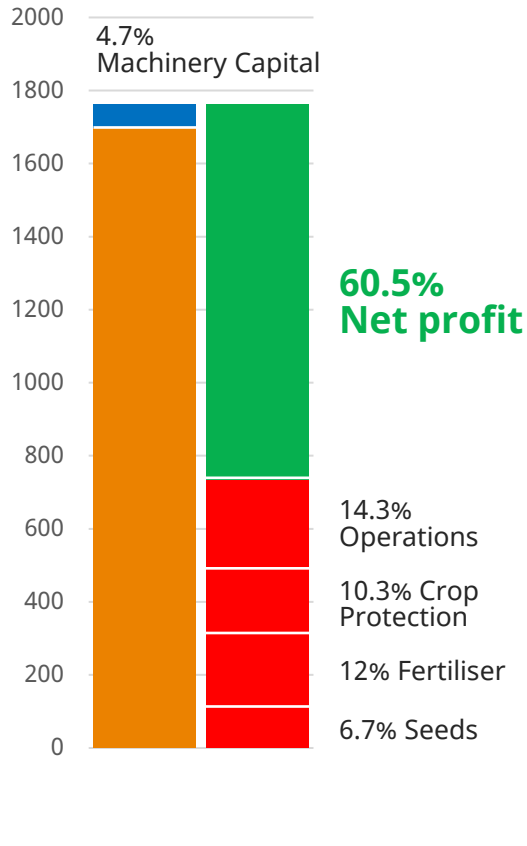
Conventional System
4-year average cost breakdown



Sustainable System 1
4-year average cost breakdown
with machinery cost savings



Sustainable System 2
4-year average cost breakdown
with machinery cost savings



Net profit:
Capital cost savings SS1 = £50/ha, SS2 = £65/ha compared to Conventional when spreading capital costs over 5 years

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Syngenta 5-year summary UK

All results are comparing Sustainable System 2 (direct drill / light till) against the Conventional System (plough) averaged across the seasons (Lenham 4 years and Loddington 5 years)

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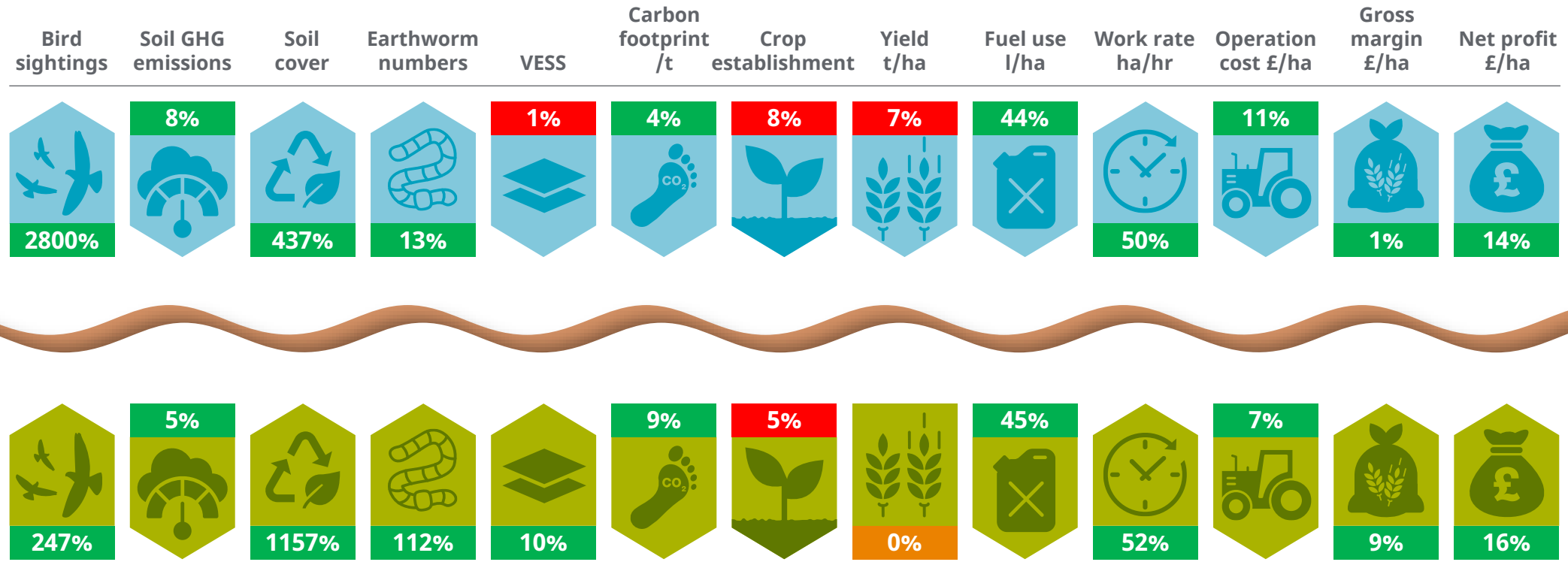

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Thank you!

Any questions???